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Introduction

Environmental characteristics affect people's survival and reproductive success. Under conditions of environmental harshness and limited resources, prosociality and cooperation are generally needed to survive and reproduce successfully. There is a broad consensus that people adopt a faster life-history strategy by focusing on short-term outcomes in such environments, but it is unclear how prosociality varies with ecological environments.



Method

We carried out a nationwide survey in China (Study 1; N = 22,652; 49.25% females; age range = 17–97 years) and used World Value Survey (WVS) data from 57 countries (Study 2; N = 79,619; 51.74% females; age range = 16–99 years).

We used the Human Development Index (HDI) as an indicator for the ecological environments of different areas. Different measures were used to assess the level of prosociality:

Study 1. Prosociality was measured by the dictator game:

Participants were asked to propose a division of ¥100 between self and an anonymous person.

Study 2. Prosociality was measured using two items in the WVS : 1)

It is important to do something for the good of society and 2) It is important to looking after environment, care for nature and save life resources.

We estimated the effects of HDI and demographic variables on prosociality using mixed-effects linear regression in R.

Results

We consistently found that HDI is negatively associated with prosociality after controlling for the demographic variables. Namely, individuals living in harsher and more unpredictable environments displayed greater prosociality.

Study 1

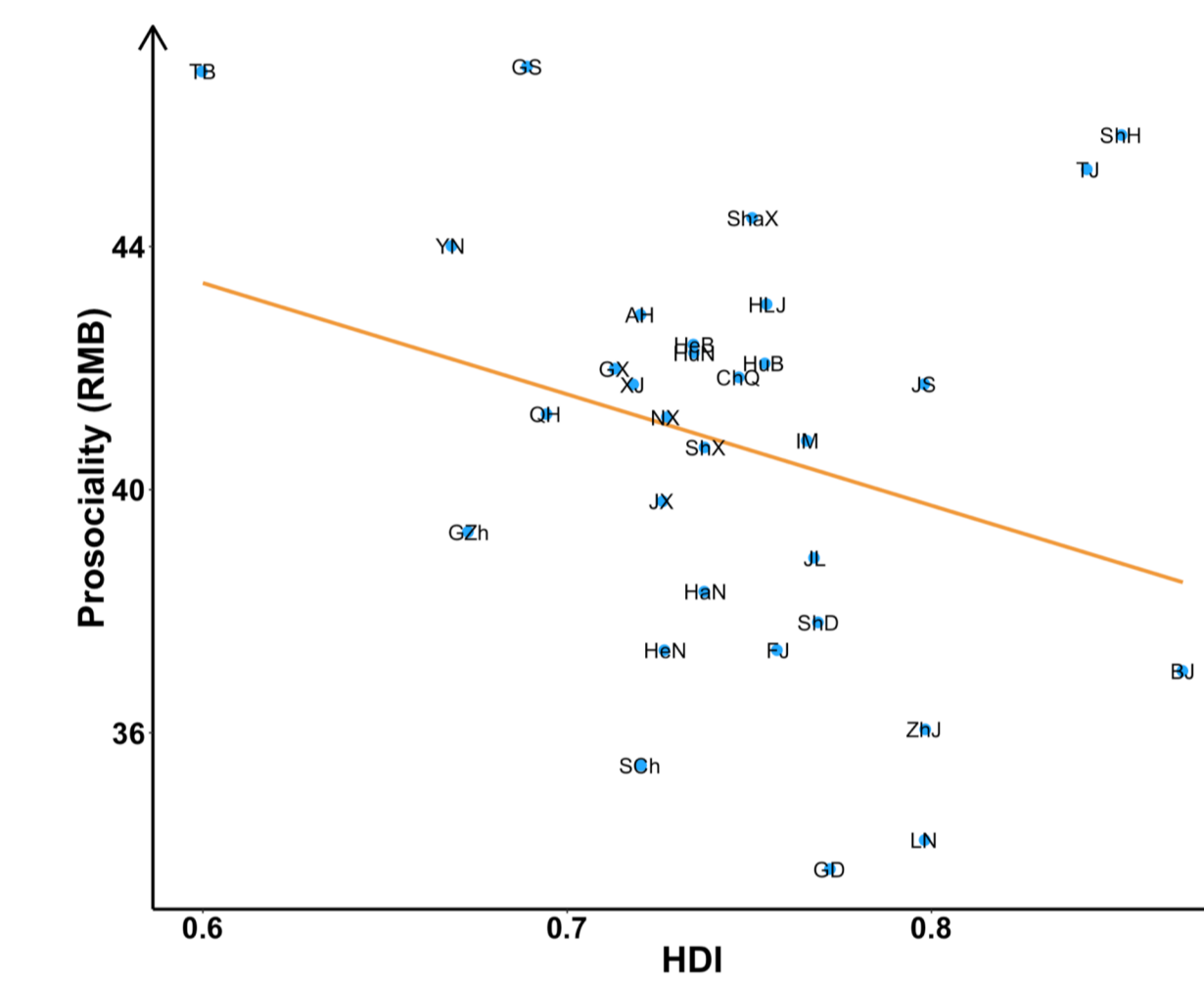


Figure 1. Descriptive statistics of prosociality and the HDI for each province. Values on the y axis represent average amount offered by the respondents in the dictator game.

Predictor	Model 1				Model 2				Model 3			
	b	SE	T score	P value	b	SE	T score	P value	b	SE	T score	P value
Intercept	40.72	0.60	67.31	<.001	40.73	0.58	70.77	<.001	40.64	0.57	71.82	<.001
Age	0.85	0.16	5.31	<.001	0.86	0.16	5.36	<.001	0.88	0.16	5.44	<.001
Gender	0.32	0.12	2.55	.011	0.32	0.12	2.56	.010	0.32	0.12	2.58	.009
Education	0.59	0.16	3.83	<.001	0.61	0.16	3.90	<.001	0.61	0.16	3.93	<.001
Marital status	0.75	0.16	4.76	<.001	0.75	0.16	4.75	<.001	0.74	0.16	4.69	<.001
Income	0.07	0.14	0.49	.627	0.08	0.14	0.54	.587	0.10	0.14	0.72	.474
HDI					-0.96	0.47	-2.05	.049	-1.00	0.46	-2.17	.038
HDI × Age									0.41	0.16	2.64	.008
HDI × Gender									-0.02	0.12	-0.19	.848
HDI × Education									0.17	0.15	1.11	.266
HDI × Marital status									0.04	0.15	0.27	.791
HDI × Income									0.12	0.14	0.87	.384

Table 1. Estimated fixed-effects coefficients from the mixed-effects regression models of prosocial behavior across 31 provinces in China

Study 2

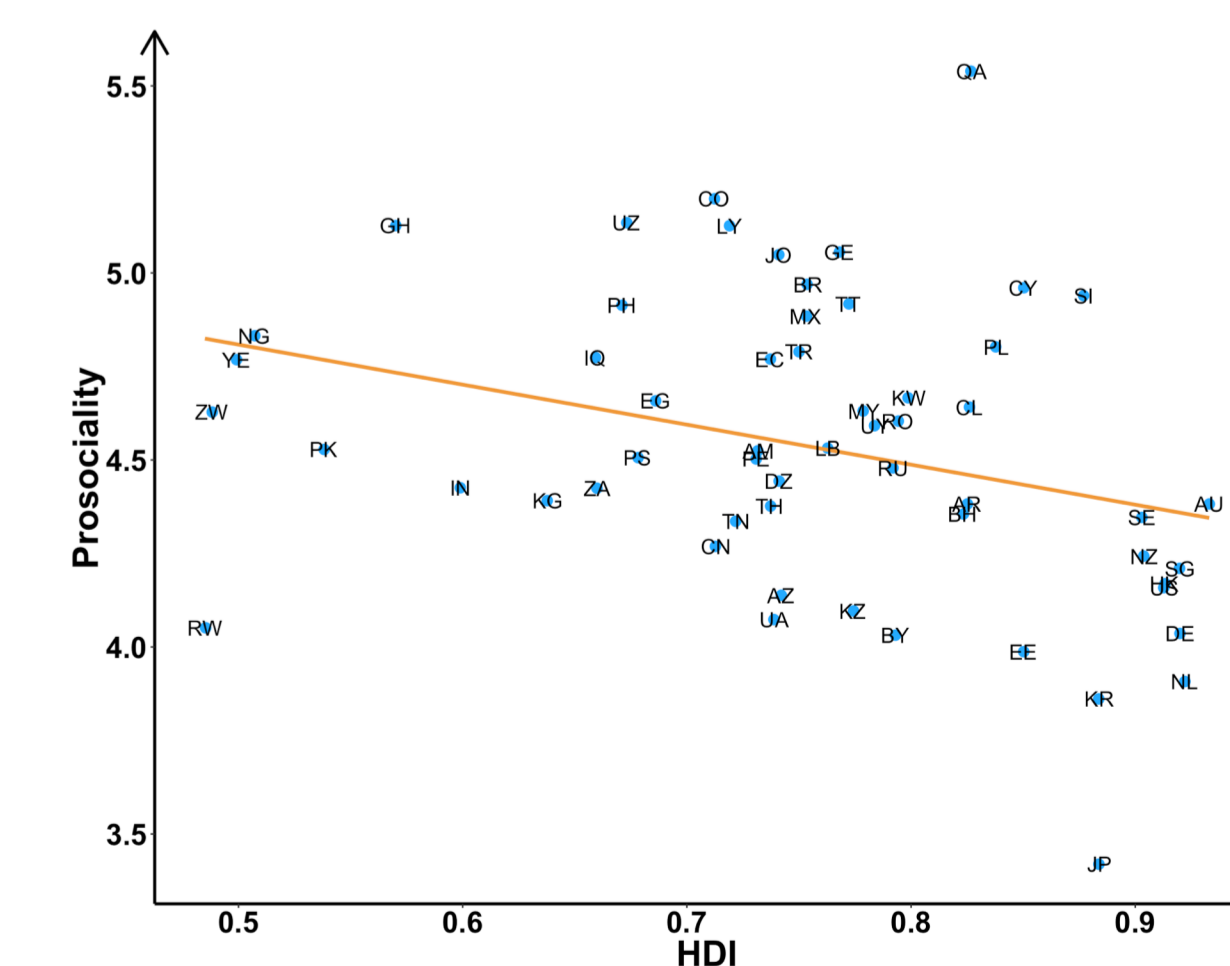


Figure 2. Descriptive statistics of prosociality and the HDI value for each country. Values on the y axis represent average scores of the two items measuring prosociality in the WVS.

Predictor	Model 1				Model 2				Model 3			
	b	SE	T score	P value	b	SE	T score	P value	b	SE	T score	P value
Intercept	4.53	0.06	76.06	<.001	4.56	0.06	78.37	<.001	4.55	0.06	77.05	<.001
Age	0.08	0.004	17.98	<.001	0.08	0.004	18.08	<.001	0.07	0.004	16.09	<.001
Gender	0.01	0.004	3.58	<.001	0.01	0.004	3.58	<.001	0.01	0.004	3.33	<.001
Education	0.09	0.004	21.16	<.001	0.09	0.004	21.24	<.001	0.09	0.004	20.49	<.001
Marital status	-0.001	0.004	-0.01	.990	-0.001	0.004	-0.03	.975	0.002	0.004	0.40	.693
Income	-0.006	0.004	-1.45	.146	-0.006	0.004	-1.46	.145	-0.004	0.004	-1.15	.252
HDI					-0.28	0.05	-5.27	<.001	-0.28	0.05	-5.20	<.001
HDI × Age									0.04	0.005	8.00	<.001
HDI × Gender									0.03	0.004	8.87	<.001
HDI × Education									0.009	0.004	2.20	.028
HDI × Marital status									0.005	0.004	1.26	.207
HDI × Income									0.01	0.004	2.72	.007

Table 2. Estimated fixed-effects coefficients from the mixed-effects regression models of prosocial behavior across 57 countries

We also consistently found that HDI for each country/area is significantly associated with an age effect: Higher HDI is associated with a greater age effect and thus with bigger differences between younger and older age groups.

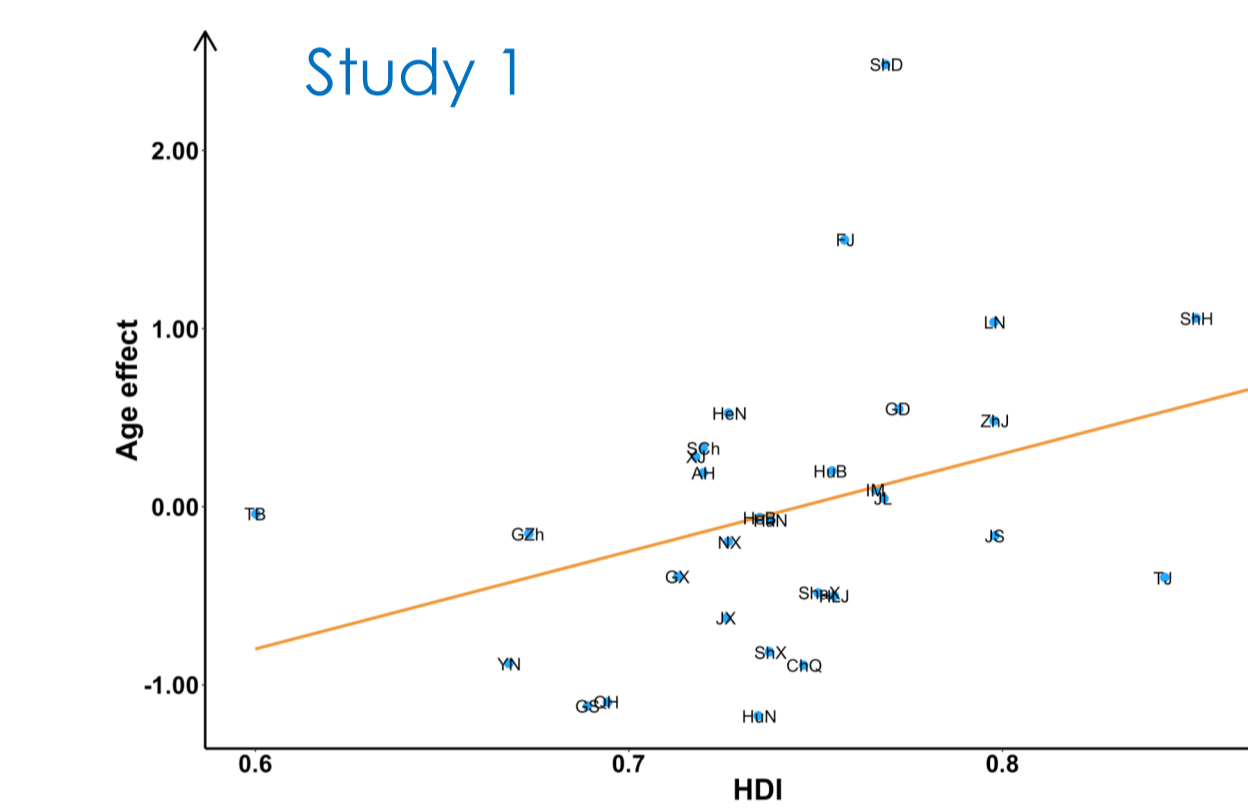


Figure 3. The relations between HDI and the province-specific age-effect estimates obtained from the mixed-effects regression model without HDI as a predictor

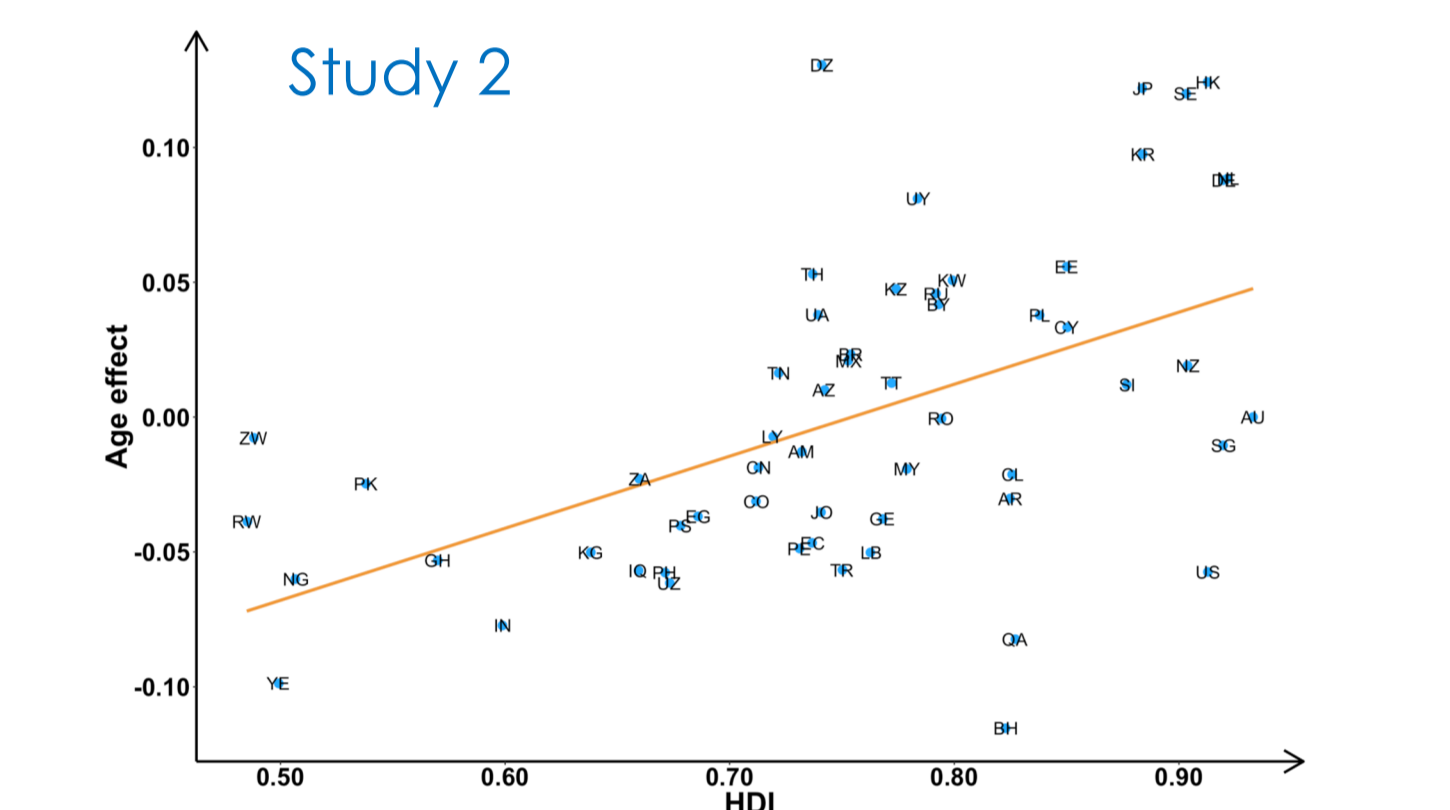


Figure 4. The relations between HDI and the country-specific age-effect estimates obtained from the mixed-effects regression model without HDI as a predictor

Conclusion

Our work supports the possibility that harsh and unpredictable environments promote prosociality while contradicting expectations from life-history theory that harsh environments inhibit prosociality.

Our findings shed light on the effects of living in a harsh, unpredictable environment and the origin of prosocial behavior.

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